



# The University of Georgia

Franklin College of Arts and Sciences  
Department of Psychology

AD-A257 432



October 26, 1992

Dr. Susan E. Chipman  
Office of Naval Research  
800 North Quincy Street  
Arlington, VA 22217-5000

Dear Dr. Chipman:

This is the first quarterly report for ONR Grant #N00014-92-J-1977. Our most interesting finding so far is that when we spread activation through the mental representations of subject matter experts, they settled significantly faster and had significantly higher harmony than the mental representations of novice Air Force recruits. Moreover, recruits who read an Air Force text that had been revised to be more coherent settled significantly faster and had significantly higher harmony than recruits who read the original, less coherent version of the text. Finally, of those recruits reading the Original version of the text, those who had constructed representations closer to the experts' representation had significantly faster settling rates and higher harmony than the others.

This is relevant to the present project in three ways. First, it means that those with more domain-specific prior knowledge (here the subject matter experts had it pre-experimentally, and the novices got it during the experiment, especially if they read the revised text) had mental structures that were more explanatorially coherent, which was what led to faster settling and higher harmony. Since domain-specific prior knowledge is the main topic of the present study, characteristic features of the mental structures of those with deeper and shallower prior knowledge structures are of great interest.

As we examine the mental structures to be collected in the present project, we will be looking for similar trends. They can be used as a deep index of the adequacy of recruits' prior knowledge structures.

Second, we can expect that a good measure of a reader's comprehension skill will be the explanatory coherence of the structure he derives from the text, as measured by its settling rate and harmony. This measure may be quite independent of the structural similarity of the novice's structure to that of an expert.

Third, in general, this result suggests a role for a connectionist individual difference, something which Rumelhart thought was "many years in the future" (personal communication, 1989). The cognitive structure test of the present project is the only reading comprehension test I know of that routinely provides data that are all ready for connectionist analysis. This means that further investigations of connectionist properties of the structures can be done easily as the project proceeds.

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Other things we have accomplished so far include:

1. Item Type Selection. After examining items from the Air Force Reading test, the Diagnostic Assessment and Reading Exam, the paragraph comprehension section of the AFQT, and the reading comprehension section of the SAT, we chose the latter two for our pilot study. This selection involved meetings with Bill Montague, Jerry Larsen, Meryl Baker, and others at NPRDC, and phone calls or correspondence with Bill Tirre and Dan Woltz of LAMP, and Brian Waters of HUMRRO.

2. Item Preparation. We have propositionalized 20 AFQT items, and are running the AFQT and SAT texts through our two computer writing aids, which respectively count coherence gaps, and help repair them. This will provide input to our cognitive structure test construction process and our rewriting process.

3. Program Development. We have constructed a computer program for interviewing experts to get their choice of terms for the cognitive structure test, and to immediately construct such a test, administer it, and print graphic representations of the structures for the experts to comment on. Incorporated in this program is a multidimensional scaling program that immediately provides a map of the results.

4. Empirical Evaluation of the Test. We have contacted Doug Savell of the Air Force Extension Course Institute (AFECI), and he has agreed to make students' scores available with protection of confidentiality. Further contacts will be made when I attend the Interservice Correspondence Exchange Annual Meeting at AFECI, October 26-29.

I evaluate our progress so far as good.

I will be reporting to you again January 1, 1993. In the meantime, if you have any questions or would like to talk, please call me at (706) 542-3094, or at home at (706) 549-4661.

Sincerely yours,

*Bruce K. Britton*

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BKB/rcm

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